Altech achieves another breakthrough with Silumina Anodes™: 55% higher energy density in lithium-ion batteries

- After further tests: use of Silumina anodes enables a 55% increase in the energy capacity of Li-ion batteries
- Average energy retention capacity of approximately 500 mAh/g
- Stable battery with sound cycling performance

Heidelberg, October 18, 2024 - Altech has reached another milestone in the development of Silumina Anodes™ for the coating of silicon for anode composite material to increase the performance of lithium-ion batteries. Through extensive further developments and tests, it has been possible to increase the energy capacity by 55% by adding Silumina Anodes™ to the lithium battery anodes. So far, Altech has achieved that Silumina Anodes™ enable at least 30 % higher energy density and thus performance of the batteries. This further increase in performance was made possible by optimizing the process of adding alumina-coated silicon particles (10%) in battery-grade graphite to create a graphite-silicon composite anode for the lithium-ion battery electrode.

In a series of tests, the Altech lithium-ion battery anode material demonstrated an average energy retention capacity of about 500 mAh/g, well above the average of about 320 mAh/g for a conventional lithium-ion battery anode. Altech's technology has shown that silicon particles can be modified in such a way that the capacity drop caused by swelling and capacity loss in the first charging cycle can be remedied.

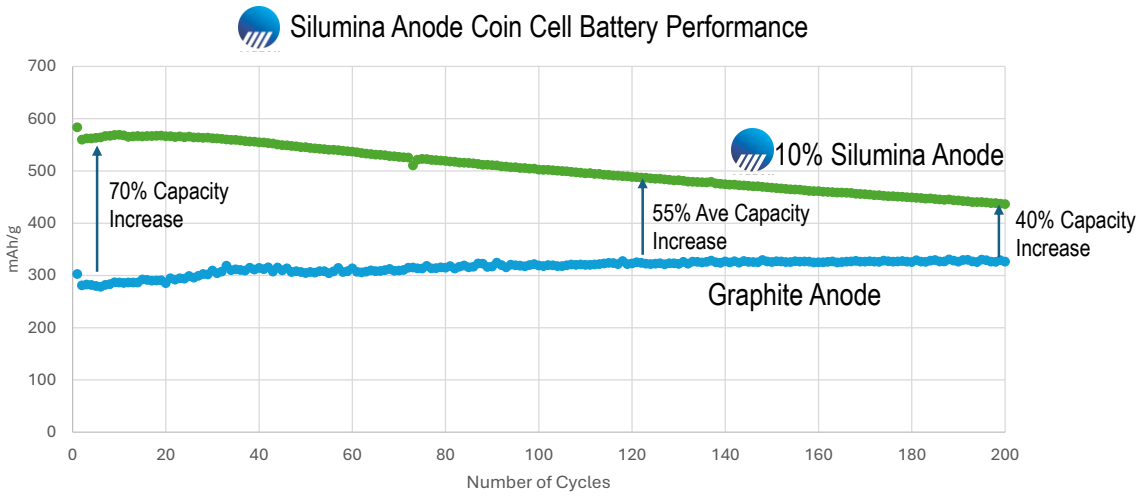

Figure 1 - Coin Half Cell Battery Performance Tests Using 10% Silumina Anode Product

Altech has also succeeded in solving outstanding problems in the dispersion of aluminum oxide-coated silicon particles by achieving improvements in organic binders and coating parameters.

Through laboratory testing of the graphite-silicon composite batteries, Altech was able to largely overcome previously unresolved obstacles associated with the use of silicon in lithium-ion battery anodes. These obstacles include swelling of silicon particles, a capacity loss of up to 50% in the first cycle and rapid degradation of the battery. Altech's tests have shown that the innovative graphite-silicon composite batteries are able to overcome these challenges by making the silicon particles spherical. The spherical structure allows the alumina-coated silicon to be distributed in the graphite cavities, minimizing damage to the electrode layer due to expansion (see Figures 2 and 3). In this way, the aluminum oxide coating copes well with the negative effects of silicon expansion in a lithium-ion battery.

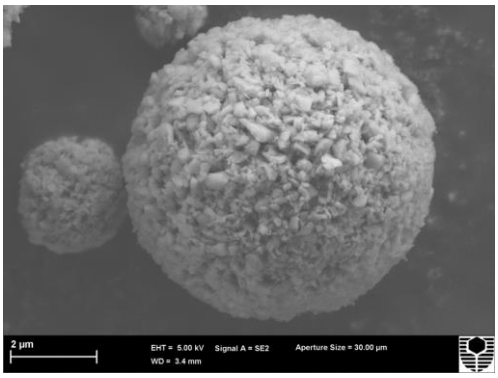

Figure 2 - SEM Image, An Alumina Treated Silicon Sphere

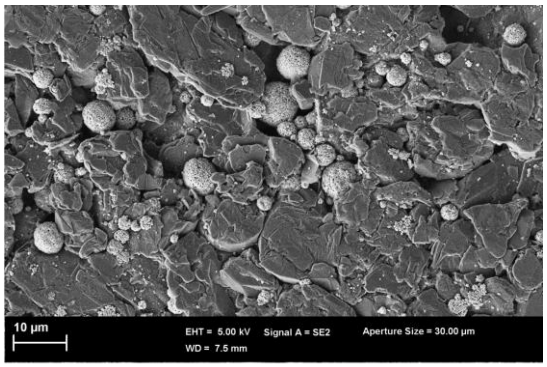

Figure 3 - SEM Image, Silicon Sphere Distributed in Graphite Voids

The lithium-ion battery industry has recognized the introduction of silicon in battery anodes as a crucial step in achieving a significant increase in energy density while reducing costs. This is because silicon has about ten times the energy storage capacity of graphite, making it an ideal anode material for the next generation of lithium-ion batteries. Until now, however, the use of silicon in commercial lithium-ion batteries has been limited due to two key drawbacks. First, silicon particles expand by up to 300% of their volume during battery charging, leading to particle swelling, breakage and eventual battery failure. Secondly, silicon deactivates a high percentage of the lithium ions in a battery, which immediately reduces the performance and life of the battery.

Figure 4 - Silumina Anode pilot plant in Dock 3, Schwarze Pumpe, Saxony

Altech completed a definitive feasibility study (https://www.altechadvancedmaterials.com/wp-content/uploads/2022/06/Summary-DFS_EN_v2.pdf) for the construction of an 8,000 tpa Silumina Anodes™ plant in Saxony, Germany, which includes the following economic aspects.

- Pre-tax Net Present Value (NPV10) of 684 million euros
- Low capital costs of 112 million euros
- Attractive internal rate of return of 34
- EBITDA 105 million euros p.a.
- Payback period 2.4 years
- Annual revenue of 328 million euros

Altech has built a pilot plant next to the planned project site in Schwarze Pumpe to enable the qualification process for its product Silumina Anodes™. The company has successfully completed the construction of the pilot plant.

Uwe Ahrens, CEO Altech Advanced Materials: *"We are very pleased with the progress we have made in overcoming the critical challenges associated with the use of silicon in lithium-ion battery anodes. Our breakthrough technology enables the full potential of silicon in lithium-ion batteries to be unlocked. It has the potential to revolutionize the battery industry. We are currently commissioning a pilot plant to further develop our technology and bring it to market maturity"*.

About Altech Advanced Materials AG

Altech Advanced Materials AG (ISIN: DE000A31C3Y4), based in Frankfurt am Main, is a holding company listed on the regulated market of the Frankfurt Stock Exchange. The company's aim is to participate in the market for solid-state batteries for stationary battery applications with CERENERGY.

Another focus is on lithium-ion batteries. An innovative anode material based on high-purity aluminum oxide (HPA) - Silumina Anodes - is intended to significantly increase the performance of this battery for electromobility.

Further information: www.altechadvancedmaterials.com

Altech Advanced Materials AG

The Executive Board: Iggy Tan, Uwe Ahrens, Hansjörg Plaggemars
Ziegelhäuser Landstrasse 3
69120 Heidelberg
info@altechadvancedmaterials.com
Tel: + 49 6221 649 2482
www.altechadvancedmaterials.com

Press contact:
Ralf Droz / Doron Kaufmann, edicto GmbH
Tel: +49 (0) 69 905505-54
E-Mail: AltechAdvancedMaterials@edicto.de